

In Figures 30–34, the placement of simulated waste in four 0.6-m (2-ft) layers is shown. The position of each waste form was surveyed after placement. Figure 31 shows the corners of Layer 1 being surveyed after placement and after being covered with a layer of dirt. Basically, each simulated waste container was surveyed such that once buried a three dimensional map of the waste could be recreated. This three dimensional map of each waste form is in Appendix E.



Figure 30. Lower-level 0–0.6 m (0–2 ft).



Figure 31. This picture shows the corners of Layer 1 being surveyed after being covered with a layer of dirt following placement.



Figure 32. Layer 2, surrogate waste orientation 0.6–1.2 m (2–4 ft).



Figure 33. Layer 3, surrogate waste orientation 1.2–1.8 m (4–6 ft).



Figure 34. Top layer 1.8–2.4 m (6–8 ft).

Once the pit was constructed by completing a backfill of INEEL soil, a large 80 x 122 ft. weather structure was constructed over the top of the pit as shown in Figure 35.

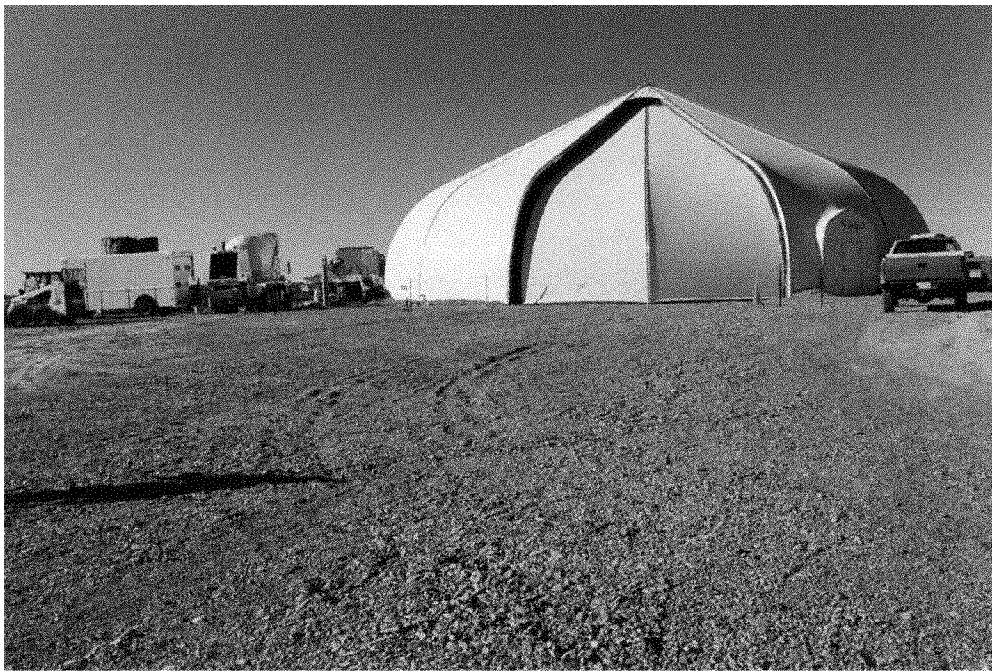


Figure 35. Weather structure constructed over the pit (Photo PNOL-520-1-1).

5.2 Equipment

5.2.1 Grouting System

The grouting system was identical to that used for the implementability testing, except that an elaborate removable contamination control shroud/drill string assembly was used in place of a simple drill string assembly. The major components outside the weather structure were the CASA GRANDE JET-5 pump, the vortex mixer and delivery system, and the high pressure hoses and fittings. Inside the weather structure was the CASA GRANDE C-6 drilling apparatus.

The shroud system was designed to provide a HEPA-filtered flexible double containment of the rotating drill steel during the grouting process. It consisted of a special sealed housing at the top of the drill steel that involved a double grease seal of the rotating drill steel against a canned seal material. To this housing seal was attached a double flexible inner and outer shroud. The space between the inner and outer flexible shroud had a dedicated passive HEPA filter and the space between the drill steel and the inner flexible hose had another dedicated passive HEPA filtration system. At the bottom of the drill steel was a cylinder to which the flexible inner and outer shrouds were attached. This cylinder was called the stinger, and the outside diameter of this cylinder was smooth and was the surface for attaching plastic sheets that were an inherent part of the thrust block glovebox system described next.

Figure 36 shows the drill string shroud in a nearly fully extended position, clearly showing the attachment of the plastic sheeting at the bottom of the stinger, the upper and lower HEPA filters covering the insides of the shroud, and the upper brass seal against which the rotating drill steel is sealed with a double grease seal.

5.2.2 Thrust Block/Contamination Control Features

The thrust block was placed over the pit and bermed with soil such that track mounted drilling system could operate on a level surface. The thrust block only covered part of the pit such that the grouting was divided into two separate operations, one operation with contamination control and the recording of appropriate data related to contamination control and a separate operation without contamination control. Figure 37 shows a schematic with the outline of the thrust block also showing the outline of the pit. The contamination control was to be in effect for holes 1-54 and holes 55-114 were to be accomplished without contamination control.

The thrust block holes [all on an 50 cm (20 in.) triangular pitch matrix] and all other holes [also on a 50 cm (20 in.) triangular pitch] on the pit were predetermined to coordinate with the location of various waste forms to ensure that certain holes corresponded exactly to certain simulated waste materials (specifically the nitrate salts and organic sludges).

The thrust block and shroud assembly on the drill string were specially designed to create a “glovebox” environment for the grouting process. The thrust block was made of carbon steel leaving a 43 cm (17 in.) vertical space to collect grout returns. By using carbon steel rather than concrete, allowed less support structures under the thrust block and more room for grout returns. Basically, the thrust block is a simple box with preformed holes on top that allowed insertion of the drill steel. The thrust block included elaborately designed double “plastic sleeve” ports for each hole in addition to a plastic diaphragm across the bottom of the hole. Referring back to Figure 2, details of the thrust



Figure 36. Drill string shroud in operation (Photo PN01-520-4-22).

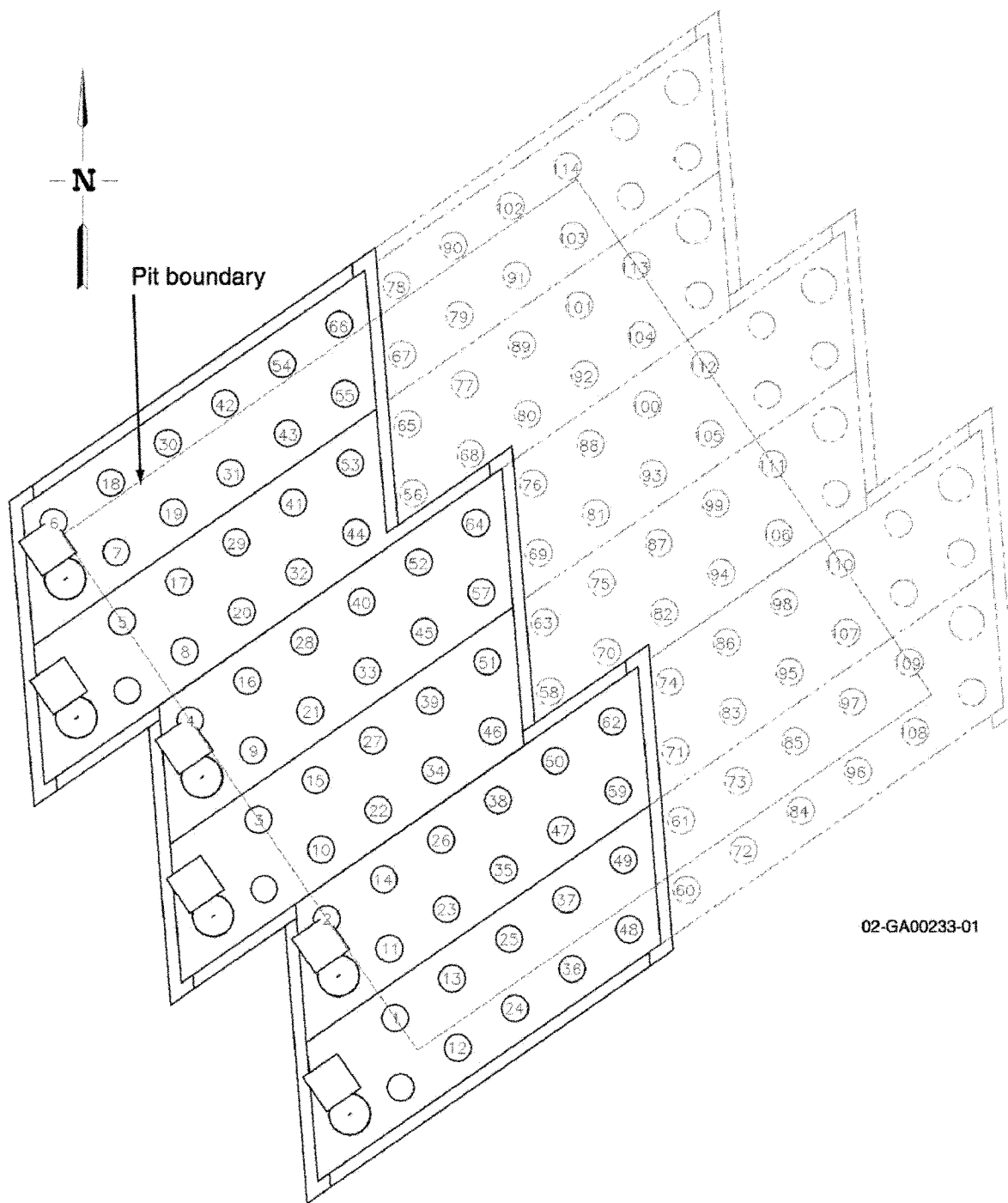


Figure 37. Schematic of the thrust block over the pit showing the hole numbering scheme.

block include the plastic sleeves, the diaphragm, a common pipe wiper to remove excess grout/soil/waste from the drill string when raising the drill steel out of the pit.

The underside of the thrust block shown in Figure 38 shows the plastic diaphragm, which allowed pulling the double plastic sleeve around the drill steel without exposing the inner surface of the thrust block to the workers above. Figure 38 also shows the a special rigid plastic plate that aids in removing the plastic diaphragm material such that the material does not foul the drill string under the thrust block and cause this material to come up inside the plastic sleeves once the drill string is withdrawn.

Not shown in Figure 38 is the wiper blade just under the plastic plate which is a rigid rubber material that is solidly supported by brackets under the thrust block. This rigid rubber wiper allows the drill string steel to be cleaned as it is withdrawn from the thrust block.

Figure 39 shows the top surface of the thrust block with the double plastic sleeves removed from the holes and attached to the drill string shroud assembly. It was necessary to treat the 10-mil thick plastic sheeting with common baby powder to allow the plastic to be flexible enough to perform the elaborate sealing of the plastic on the drill stem stinger. Once the double plastic sleeve was attached to the drill steel, the diaphragm was punctured or pulled off by insertion of the drill steel against the rigid plastic plate. In addition, the top of the hole is slightly recessed and each hole had a solid metal top that allowed a flat surface on the thrust block.

Other design features of the thrust block included inlet and outlet holes for attaching a manifold for the HEPA air filtration system. Also, special vent manifolds were attached to the top of the thrust block to allow release of free air through special HEPA filters as the thrust block was filled with grout during a final thrust block fill phase discussed later. Additional penetrations in the top of the thrust block included special fill locations in which the final fill of grout was to take place. In these locations, the double plastic sleeve and diaphragm are also utilized.

The thrust block was bermed with dirt providing an airtight seal to the ground surface. The berming of the thrust block also allowed the drill platform to operate in a more or less level environment for all positions on the thrust block. In addition, the thrust block included ports and manifolds for a High Efficiency Particulate Air filtration system with inlet and outlet manifolds. This system also allowed keeping a negative pressure and a Data Acquisition System allowed measurement of negative pressure and temperature and relative humidity of the air going into the filters.

Figure 40 shows the drill string assembly in position on top of the thrust block. This figure shows the outlet manifold for the HEPA filtration system, the special vent ports used for final filling, and the camera view port with camera inserted. Also shown is the double flexible shroud around the drill string.

In the background, is a control trailer to which is fed the data from the HEPA filtration system (relative humidity, pressure relative to atmosphere under the thrust block) and most importantly the video taped view of the grouting operation under the thrust block. Also shown in Figure 40 are the holes with flush-mounted metal tops.



Figure 38. Detail of the underside of the thrust block showing plastic diaphragm and the rigid plastic plate.



Figure 39. Plastic sleeves extended out of thrust block in preparation for testing (treated with talcum powder) (Photo PN01-520-3-5A).